MET – ATM Integration

• Global Air Navigation Plan (GANP)
• Aviation System Block Upgrade (ASBU)

WMO Aeronautical Meteorology Scientific Conference
6 – 10 November 2017, Toulouse, France

Peter Lechner
Chairman, ICAO Meteorology Panel,
Chief Meteorological officer, Civil Aviation Authority of New Zealand

Neil Halsey
Meteorology Panel Secretariat
Technical Officer, ICAO
The Value of MET information

The annual accounting value of meteorological information for global aviation is around **US $30 Billion**

- Extrapolated pro-rata from UK figures.
- Global airline turnover in 2016 was US$709 Billion
- Global GDP Contribution in 2012 was US$2.4 Trillion
The MET Revolution
The METP shall collaboratively determine operational requirements for aeronautical MET service provision as an enabling function for a future globally interoperable air traffic management system, and identify solutions, in coordination with WMO, to effectively and efficiently fulfil the requirements through sound scientific and/or technological capabilities.

• 28 Independent expert members
• ~ 50 Advisers to the experts
• METP meets formally on 18 month cycle
• Working Groups and Work streams meet at least annually
• Frequent teleconferences to co-ordinate work
ICAO Air Navigation Commission

Meteorology Panel
(comprising individual Experts – not State representatives)
Peter Lechner
Bill Maynard

WG-1 MET
Requirements and Integration (WG-MRI)
Dennis Hart, Jun Ryuzaki

WG-2 MET Information & Service Development (WG-MISD)
Richard Heuwinkel
CM Shun

WG-3 MET Information Exchange (WG-MIE)
Sue O’Rourke
Bill Maynard

WG-4 MET Operations Group (WG-MOG)
Colin Hord

WG-5 MET Cost Recovery Guidance and Governance (WG-MCRGG)
Rodrigo Fajardo

METP Management Group Co-ordination work

WS-1 MET for ATM
Rick Heuwinkel

WS-2 GANP Update
Stephanie Desbios

WS-3 PANS MET
Michael Berechree

WS-1 RRM
Harmut Walter

WS-2 RHWAC
Sharon Lau

WS-3 Space Weather (SPW)
Pat Murphy

WS-4 Sulphur Dioxide (SO₂)
Tammy Farrar

WS-1 IWXXM Requirements
Patrick Simon/Pat Murphy

WS-2 SWIM Plan
Aaron Braeckel

WS-3 IWXXM Document
Tim Hales

WS-4 Support and Co-ord
Bill Maynard

WS-1 IAVW Operations
Emile Jansons

WS-2 WAFS Operations
Matt Strahan

WS-3 SADIS Operations
Karen Shorey

WS-1 White Paper
Dennis Hart

WS-2 TBA

Job Cards 1,2,5 (ATMRPP6)
Job Cards 6,7,9,12
Job Cards 4, (CP8)
Job Cards 3,8,10
Job Card 11

WS-1 METP Management Group Co-ordination work

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METP work streams related to GANP

GANP Drivers:
- GANP Update
- MET for ATM
- IWXXM Development
- SWIM Development
- SADIS Operations
- Radiation
- WAFS Operations
- PANS MET
- IAVW Operations

Other Drivers:
- White Paper
- Sulphur Dioxide (SO₂)
- RHWAC
Global Air Navigation Plan (GANP)
Global Air Navigation Plan (GANP)

- Rolling 15+ year strategic direction.
- Leveraging existing technologies.
- Anticipating future developments based on State/industry agreed objectives.
- Long-term vision to ensure continuity and harmonization with modernization programmes.
- Objective is to increase capacity and improve efficiency of the global civil aviation system whilst improving or at least maintaining safety.
Aviation System Block Upgrades (ASBU)

- Modules & associated Technology Roadmaps cover communications, surveillance, navigation, information management and avionics.
- Designed to be used by the Regions/sub-Regions/States when to help achieve harmonization and interoperability by their consistent application across the Regions and the world.
- Not all ASBU Modules are to be applied around the globe.
GANP Modules

Operational Thread

Enabler Thread

Operational Thread

Operational Thread
Advanced MET Information (AMET)
# Performance Improvement Area 2: Globally interoperable systems and data – through globally interoperable system-wide information management

<table>
<thead>
<tr>
<th>Block 0</th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B0-FICE</strong></td>
<td><strong>B1-FICE</strong></td>
<td><strong>B2-FICE</strong></td>
<td><strong>B3-FICE</strong></td>
</tr>
<tr>
<td>Increased interoperability, efficiency and capacity through</td>
<td>Increased interoperability, efficiency and capacity through</td>
<td>Improved coordination through multi-centre ground-ground integration</td>
<td>Improved operational performance through the introduction of Full FF-</td>
</tr>
<tr>
<td>ground-ground integration</td>
<td>FF-ICE, Step 1 application before departure</td>
<td>(FF-ICE, Step 1 and flight object, SWIM) including execution phase</td>
<td>ICE Data for all relevant flights is systematically shared between air</td>
</tr>
<tr>
<td>Supports the coordination of ground-ground data communication</td>
<td>Introduction of FF-ICE step 1, to implement ground-ground exchanges</td>
<td>FF-ICE supporting trajectory-based operations through</td>
<td>and ground systems using SWIM in support of collaborative ATM and</td>
</tr>
<tr>
<td>between ATSU, based on ATS interfacility data communication</td>
<td>before departure using common flight information reference model, FIXM,</td>
<td>exchange and distribution of information including execution phase for</td>
<td>trajectory-based operations.</td>
</tr>
<tr>
<td>(AIDC) defined by ICAO Document 9694.</td>
<td>XML and the flight object.</td>
<td>multi-centre operations using flight object implementation and</td>
<td></td>
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<td></td>
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<td>interoperability (IOP) standards.</td>
<td></td>
</tr>
<tr>
<td><strong>B0-DATM</strong></td>
<td><strong>B1-DATM</strong></td>
<td><strong>B2-SWIM</strong></td>
<td><strong>B3-AMET</strong></td>
</tr>
<tr>
<td>Service improvement through digital aeronautical information management</td>
<td>Service improvement through integration of all digital ATM information</td>
<td>Enabling airborne participation in collaborative ATM through SWIM</td>
<td>Enhanced operational decisions through integrated meteorological</td>
</tr>
<tr>
<td>Initial introduction of digital processing and management of</td>
<td>This module addresses the need for increased information integration</td>
<td>Connection of the aircraft as an information node in SWIM enabling</td>
<td>information (near-term and immediate service)</td>
</tr>
<tr>
<td>information, by the implementation of AIS/AIM making use of</td>
<td>and will support a new concept of ATM information exchange fostering</td>
<td>participation in collaborative ATM processes with exchange of data</td>
<td></td>
</tr>
<tr>
<td>AIXM, moving to electronic AIP and better quality and availability of</td>
<td>access via internet-protocol-based tools Exchange models such as AIXM,</td>
<td>including meteorology.</td>
<td></td>
</tr>
<tr>
<td>data.</td>
<td>FIXM, IWXXM and others relate their concepts to the AIRM fostering</td>
<td></td>
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<td></td>
<td>convergence, re-use, and collaborative alignment.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B0-SWIM</strong></td>
<td><strong>B1-SWIM</strong></td>
<td><strong>B2-AMET</strong></td>
<td><strong>B3-AMET</strong></td>
</tr>
<tr>
<td>Performance improvement through the application of system-wide</td>
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<td>Enhanced operational decisions through integrated meteorological</td>
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</tr>
<tr>
<td>information management (SWIM)</td>
<td>information management (SWIM)</td>
<td>information (near-term and immediate service)</td>
<td></td>
</tr>
<tr>
<td>Implementation of SWIM services (applications and infrastructure)</td>
<td>Implementation of SWIM services (applications and infrastructure)</td>
<td>Meteorological information supporting both air and ground automated</td>
<td></td>
</tr>
<tr>
<td>creating the aviation intranet based on standard data models, and</td>
<td>creating the aviation intranet based on standard data models, and</td>
<td>decision support aids for implementing immediate weather mitigation</td>
<td></td>
</tr>
<tr>
<td>internet-based protocols to maximize interoperability</td>
<td>internet-based protocols to maximize interoperability</td>
<td>strategies.</td>
<td></td>
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</table>

**B0-AMET**  
Meteorological information supporting enhanced operational efficiency and safety  
Global, regional and local meteorological information provided by world area forecast centres, volcanic ash advisory centres, tropical cyclone advisory centres, aerodrome meteorological offices and meteorological watch offices in support of flexible airspace management, improved situational awareness and collaborative decision-making, and dynamically-optimized flight trajectory planning.
- **ASBU Block**
  - Specific concept of operations.
  - Deadline for an element to be available for implementation.
- **ASBU Thread**
  - Key feature area of the air navigation system. Operational, Enabler, Network/Infrastructure.
- **ASBU Element**
  - A specific operational improvement
- **ASBU Enabler**
  - Component (standards, procedures, training, technology,...)
- **ASBU Module**
  - A group of elements from a thread.
GANP 2019 – AMET Module

- Meteorology is an enabler for the majority of the other Threads.
- Challenge is to ensure that all the other ASBU threads and related modules are able to fully articulate the requirements they have for MET information in the future.
- This means looking at the MET information required, rather than existing products.
- Information includes phenomenon/parameter and data characteristics such as severity, accumulation, intensity, probability of occurrence, confidence/uncertainty of forecasts and reliability, etc.
- Evolution driven by the transition to the SWIM environment and by the need for more interoperability allowing integration of MET information in ATM systems.
<table>
<thead>
<tr>
<th>AMET Block 0:</th>
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<tbody>
<tr>
<td>Global, regional and local meteorological information to support flexible</td>
<td>Meteorological information supporting automated decision process or aids,</td>
</tr>
<tr>
<td>airspace management, improved situational awareness, collaborative</td>
<td>involving meteorological information, meteorological information translation,</td>
</tr>
<tr>
<td>decision-making and dynamically optimized flight trajectory planning.</td>
<td>ATM impact conversion and ATM decision support.</td>
</tr>
<tr>
<td>AMET-B0/1: Meteorological observation products</td>
<td>AMET-B1/1: Meteorological observation information</td>
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<tr>
<td>AMET-B0/2: Meteorological forecast products</td>
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<td>AMET-B0/3: Meteorological advisory and warning products</td>
<td>AMET-B1/3: Climatological and historical meteorological information</td>
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<tr>
<td>AMET-B0/4: Climatological and historical meteorological products</td>
<td>AMET-B1/4: Meteorological information in SWIM</td>
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<tr>
<td>AMET-B0/5: Dissemination of meteorological products</td>
<td></td>
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GANP 2019 – AMET Module

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<th>AMET Block 0: New capabilities</th>
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<tr>
<td>• Provision of additional observations. More automated observations. Higher temporal and spatial resolution for lightning, radar and satellite information.</td>
<td>• Commencement of change from <strong>product-centric</strong> to <strong>data-centric</strong> information (parameters and phenomena, and their associated characteristics).</td>
</tr>
<tr>
<td>• Greater resolution (spatial and temporal) of gridded WAFS information. ICE, TURB, CB WAFS. Improved visualization of meteorological forecast products.</td>
<td>• Space weather information. Sulphur dioxide (SO₂) services. Enhanced hazardous weather services.</td>
</tr>
<tr>
<td>• Improved visualization of meteorological advisory and warning products. VAA extended period forecasts. Increased VAAC domain.</td>
<td>• Climatological data. Climate change information.</td>
</tr>
<tr>
<td>• Commencement of the exchange of meteorological information using the ICAO Meteorological Information Exchange Model (IWXXM), being the conversion of Traditional Alphanumeric Code (TAC), using an IWXXM schema, into XML/GML.</td>
<td>• Meteorological information in ICAO Meteorological Information Exchange Model (IWXXM) form starts to replace traditional alphanumeric code (TAC) products. <strong>Human-readable products will start to be derived from the IWXXM information</strong> (rather than the other way around). The introduction of web services allows for progressive replacement of fixed line dissemination systems.</td>
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